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(51) International Patent Classification <sup>6</sup> : <b>C07J 41/00, A61K 31/57, C07J 43/00, A61K 31/56, 31/575, 31/58</b>		<b>A3</b>	(11) International Publication Number: <b>WO 99/33859</b>
			(43) International Publication Date: 8 July 1999 (08.07.99)
<p>(21) International Application Number: PCT/US98/27406</p> <p>(22) International Filing Date: 23 December 1998 (23.12.98)</p> <p>(30) Priority Data: 08/998,877 24 December 1997 (24.12.97) US</p> <p>(71) Applicant: SRI INTERNATIONAL [US/US]; 333 Ravenswood Avenue, Menlo Park, CA 94025 (US).</p> <p>(72) Inventors: TANABE, Masato, 972 Moreno, Palo Alto, CA 94303 (US). PETERS, Richard, H.; 365 Springpark Circle, San Jose, CA 95136 (US). CHAO, Wan-Ru; 1510 Oriole Avenue, Sunnyvale, CA 94087 (US). JONG, Ling; 681 Endicott Drive, Sunnyvale, CA 94087 (US).</p> <p>(74) Agents: REED, Dianne, E. et al.; Reed &amp; Associates, 3282 Alpine Road, Portola Valley, CA 94028 (US).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW. ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report.</i></p> <p>(88) Date of publication of the international search report: 23 December 1999 (23.12.99)</p>	
(54) Title: NOVEL ANTI-ESTROGENIC STEROIDS, AND ASSOCIATED PHARMACEUTICAL COMPOSITIONS AND METHODS OF USE			
(57) Abstract			
<p>Novel anti-estrogenic compounds are provided which are useful to treat a variety of disorders, particularly estrogen-dependant disorders. Preferred compounds have 1,3,5-estratriene nucleus, and are substituted at the C-17 or C-11 position with a molecular moiety which renders the compounds effective to competitively block the binding of estrogen to its receptor. Particularly preferred compounds are 17-desoxy-1,3,5-estratrienes. Therapeutic methods and pharmaceutical compositions are provided as well.</p>			

\* (Referred to in PCT Gazette No. 38/1999, Section II)

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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 98/27406

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 C07J41/00 A61K31/57 C07J43/00 A61K31/56 A61K31/575  
A61K31/58

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 C07J A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	POIRIER D ET AL: "D-ring alkylamide derivatives of estradiol: effect on ER-binding affinity and antiestrogenic activity" BIOORGANIC & MEDICINAL CHEMISTRY LETTERS, vol. 6, no. 21, 5 November 1996 (1996-11-05), page 2537-2542 XP004135909 the whole document	8-11, 14-20, 23-36, 41
A	PETERS R H ET AL: "17-DESOXY ESTROGEN ANALOGUES" JOURNAL OF MEDICINAL CHEMISTRY, vol. 32, no. 7, July 1989 (1989-07), pages 1642-1652, XP002005625	8-10, 14-19, 23-37
X	page 1646; tables II, III in particular table II, compounds 12, 24, 36 on page 1646	11, 20, 41

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search

26 July 1999

Date of mailing of the international search report

24.08.99

Name and mailing address of the ISA

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## INTERNATIONAL SEARCH REPORT

national Application No  
PCT/US 98/27406

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A	US 3 318 917 A (W. R. BENN ET AL) 9 May 1967 (1967-05-09)  page 2, line 29 - line 37; examples 9-14 ---	8-10, 14-16, 23-36,41
A	US 3 448 126 A (BENN WALTER R) 3 June 1969 (1969-06-03)  column 3, line 38 - line 43; claim 1 ---	8-10, 14-16, 23-36,41
A	WO 93 13123 A (ROUSSEL UCLAF) 8 July 1993 (1993-07-08)  the whole document, in particular page 17, paragraph 3-4 and pages 67-68 ---	8-10, 14-19, 23-36,41
A	US 3 271 428 A (F. J. VILLANI ET AL) 6 September 1966 (1966-09-06)  column 2, line 58 - line 68; examples 1,2,5 ---	8-10, 14-19, 23-36,41
X	S. MIYAIRI ET AL: "Structure of the Adduct of 16.alpha.-hydroxyestrone with a Primary Amine: Evidence for the Heyns Rearrangement of Steroidal D-Ring alpha-Hydroxyimines" STERIODS: STRUCTURE, FUNCTION, AND REGULATION., vol. 56, no. 7, July 1991 (1991-07), pages 361-366, XP002109814 ELSEVIER SCIENCE PUBLISHERS, NEW YORK, NY., US ISSN: 0039-128X compounds 1 and 3 on page 363 ---	14
X	US 3 536 703 A (COLTON FRANK B ET AL) 27 October 1970 (1970-10-27) column 2, line 56 - line 67; example 8 ---	8,14,41
X	R. CONSUELO ET AL: "Effects of 17.beta.-(N,N-Diethylaminethyl)-amino-1,3, 5(10)-estratrien-3-ol, and its Androstane Analog on Blood Clotting Time" MEDICINAL CHEMISTRY RESEARCH, vol. 7, no. 2, February 1997 (1997-02), pages 67-75, XP002109815 compound 1a on page 68 ---	14
X	US 3 716 530 A (KRUBINER A ET AL) 13 February 1973 (1973-02-13) example 4 ---	8,14
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	US 2 666 769 A (F. B. COLTON) 19 January 1954 (1954-01-19) column 3, line 33 - line 45 ---	8,14
A	BLICKENSTAFF, ROBERT T. ET AL: "Synthesis of some analogs of estradiol" STEROIDS... vol. 46, no. 4/5, November 1985 (1985-11), XP002109816 ELSEVIER SCIENCE PUBLISHERS, NEW YORK, NY., US page 897, compounds 19 and 23 and page 898; table 2 ---	14
A	DATABASE WPI Section Ch, Derwent Publications Ltd., London, GB; Class B00, AN 66-33967F XP002109827 & JP 43 021058 B (DAINIPPON SEIYAKU KK) abstract ---	8,14, 23-36,41
X	US 2 840 581 A (J. HOGG ET AL) 24 June 1958 (1958-06-24)  column 1, line 35 - line 52; examples 4-6,13-15,17-19 ---	8,14, 28-30, 33,35, 36,41
A	DE 23 61 120 A (AKZO NV) 12 June 1974 (1974-06-12)  page 4, paragraph 2 - paragraph 3; examples 5,6 ---	8-10, 17-19, 23-36,41
A	EP 0 471 612 A (ROUSSEL UCLAF) 19 February 1992 (1992-02-19)  page 42 - page 43; example 14 page 11, line 2 - line 8 ---	8-10, 17-19, 23-36,41
A	EP 0 546 591 A (SCHERING AG) 16 June 1993 (1993-06-16)  the whole document, in particular page 2, lines 50-52 --- -/-	8-10, 17-19, 23-36,41

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International Application No.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 405 147 A (COUNSELL RAYMOND E ET AL) 8 October 1968 (1968-10-08)  column 2, line 24 - line 31; examples 7-9 ---	20, 28, 30, 31, 33, 35, 36, 41
A	STRECKE, J. ET AL: "Animal experiments on the estrogenic and antiestrogenic effects of 17.alpha.-thiocyanomethyl-17.beta.-tetrahy dropyranyloxyestra- 1,3,5(10)-triene-3-methylether and 17.beta.- phenylaminocarbonyloestra-1,3,5(10)-triene -3-methylether" PHARMAZIE, vol. 32, no. 10, October 1997 (1997-10), pages 598-602, XP002109817 BERLIN DE compound 1 on page 598, column 1 ---	11, 23-25, 30-36, 41
A	WO 96 03995 A (HOLICK MICHAEL F) 15 February 1996 (1996-02-15)  page 5, line 1 - line 6; claim 9 ---	11-13, 20, 23-36, 41
A	CHEMICAL ABSTRACTS, vol. 76, no. 21, 22 May 1972 (1972-05-22) Columbus, Ohio, US; abstract no. 122090. AGRESTA, G. ET AL: "Biological activities of a new acetalic ether of estradiol, 17.beta.-(1',4'-dioxan-2'-yloxy)-estra-1,3 .5(10)-trien-3-ol (17-dioxanylestradiol)" page 83; column 1; XP002109825 abstract & ACTA ENDOCRINOL. (COPENHAGEN) (1972), 69(1), 95-106 , ---	11-13, 20, 23-36
A	H BRUNNER ET AL: "Synthese und Antitumoraktivität von cis-Dichloroplatin(II) -Komplexen mit Östradiolderivaten" MONATSHEFTE FÜR CHEMIE, vol. 124, no. 1, 1 January 1993 (1993-01-01), pages 83-102, XP002089839 ISSN: 0026-9247 page 98, compounds 13, 14; page 90, paragraph 4; page 91; table 2; page 92, paragraph 3 - page 93, paragraph 1 --- -/--	11-13, 20, 23-36, 41

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G.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 431 258 A (LEFEBVRE YVON ET AL) 4 March 1969 (1969-03-04) example 2 ---	11,20
A	US 3 271 392 A (Y. LEFEBVRE) 6 September 1966 (1966-09-06) the whole document, in particular column 1, lines 34-50 ---	11-13, 23-36,41
X	BE 661 288 A (ROUSSEL-UCLAF) 20 September 1965 (1965-09-20) page 3, paragraph 2 - paragraph 4; example 1 ---	11,20, 30,41
A	EL GARROUJ, DRISS ET AL: "Steroidal Affinity Labels of the Estrogen Receptor 2.17 alpha-(Haloacetamido)alkyl! estradiols" JOURNAL OF MEDICINAL CHEMISTRY., vol. 38, no. 13, 23 June 1995 (1995-06-23), pages 2339-2348, XP002109818 AMERICAN CHEMICAL SOCIETY. WASHINGTON., US ISSN: 0022-2623 page 2341, compounds 19,21,23 page 2341, column 2, paragraph 2 page 2342: table 1 ---	11,20, 23-36,41
A	ALIAU, SIGRID ET AL: "17.alpha.-(Haloacetamidoalkyl)estradiols alkylate the human estrogen receptor at cysteine residues 417 and 530" BIOCHEMISTRY., vol. 36, no. 19, 13 May 1997 (1997-05-13), pages 5861-5867, XP002109819 AMERICAN CHEMICAL SOCIETY. EASTON, PA., US ISSN: 0006-2960 page 5862, column 1, compounds 2B, 3B, 3I and figure 1 page 5864, column 2, paragraph 2 ---	11,20, 23-36,41
A	US 3 946 052 A (CROWE DAVID F ET AL) 23 March 1976 (1976-03-23) the whole document ---	11,20, 23-36,41
A	F. KINCL: "Notiz über den Mechanismus der Anti-Ovulation mit 6-Chloro-delta-6-17.alpha.-Acetoxyprogesteron in Kaninchen" ENDOKRINOLOGIE, vol. 44, no. 1/2, 1963, pages 67-71, XP002109820 LEIPZIG, DE the whole document, in particular page 69; table II ---	37

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	F. KINCL ET AL: "Antifertility Activity of Various Steroids in the Female Rat" JOURNAL OF REPRODUCTION AND FERTILITY, vol. 10, 1965, pages 105-113, XP002109821 OXFORD, GB page 108; table 3 ---	37
A	US 3 766 171 A (MARX A ET AL) 16 October 1973 (1973-10-16) column 2, line 15 - line 21; example 15 ---	38
A	CHEMICAL ABSTRACTS, vol. 114, no. 10, 11 March 1991 (1991-03-11) Columbus, Ohio, US; abstract no. 88501, BASU, KRISHNAKALI ET AL: "Effects of 3-hydrazone modification on the metabolism and protein binding of progesterone" page 429; column 2; XP002109826 abstract & INT. J. PHARM. (1990), 65(1-2), 109-14 , ---	38
A	WO 97 22618 A (VERTEX PHARMA) 26 June 1997 (1997-06-26) page 30, paragraph 1 ---	38
X	US 5 554 603 A (KIM HYUN K ET AL) 10 September 1996 (1996-09-10) column 15, line 16 - line 19; figure 4 ---	39
Y	---	39
X	WO 87 00175 A (STANFORD RES INST INT) 15 January 1987 (1987-01-15) page 28, line 15 - line 21; examples 1-9 page 31, line 12 - line 18 page 32, line 22 - page 33, line 10 ---	39
Y	---	39
Y	PETERS, RICHARD H. ET AL: "11.beta.-Nitrate estrane analogs: potent estrogens" JOURNAL OF MEDICINAL CHEMISTRY.. vol. 32, no. 10, October 1989 (1989-10), pages 2306-2310, XP002109822 AMERICAN CHEMICAL SOCIETY. WASHINGTON., US ISSN: 0022-2623 the whole document ---	39
P,X	WO 98 07740 A (SCHERING AG) 26 February 1998 (1998-02-26) page 15, paragraph 2; example 30 ---	39
Y	US 3 318 925 A (G. ANNER ET AL) 9 May 1967 (1967-05-09) example 1 ---	40
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## INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	N. PEMMARAJU ET AL: "Preparative chemical methods for aromatisation of 19-nor-delta-4,-3-oxosteroids" STEROIDS., vol. 59, no. 11, November 1994 (1994-11), pages 621-627, XP002109823 ELSEVIER SCIENCE PUBLISHERS, NEW YORK, NY., US page 624; table 2 ----	40
Y	SUN-SHINE YUAN: "Synthesis of 3,4-13C2 Steroids" STEROIDS., vol. 39, no. 3, March 1982 (1982-03), pages 279-289, XP002109824 ELSEVIER SCIENCE PUBLISHERS, NEW YORK, NY., US page 288, paragraph 2 ----	40
Y	US 3 859 365 A (YOUNG DAVID A) 7 January 1975 (1975-01-07) the whole document -----	40

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 98/27406

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:  
Remark: Although claim(s) 23-39  
is(are) directed to a method of treatment of the human/animal  
body, the search has been carried out and based on the alleged  
effects of the compound/composition.
2. ☒ Claims Nos.: 1-7  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such  
an extent that no meaningful International Search can be carried out, specifically:  
See further information sheet
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see further information sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all  
searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment  
of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report  
covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is  
restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☒ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box 1.2

Claims Nos.: 1-7

Claims 1-7 attempt to define the subject matter of the claimed invention in terms of a result to be achieved, claims 1-3 in particular give no structural features of the claimed compounds AT ALL, but rather define them in terms of their anti-estrogenic effects and low estrogenic activity. Claims 4-7 further specify two very trivial structural features, namely the *estra-1,3,5(10)-triene* structure and the 17-desoxy derivative thereof. These per se are well known structural features and give no distinction of the claimed subject matter over the state of the art, consequently the (allegedly) distinguishing feature of each of these claims is their function as anti-estrogens with low estrogenic activity as measured by a well known technique. This is also the problem to be solved by the claimed compounds (see page 5, lines 10-13 of the description). Consequently the subject matter of claims 1-7 is entirely characterised by a desideratum, i.e. the distinguishing feature of these claims over the prior art is simply to state that they must be of such a structure that they solve the stated problem. This is a wholly unacceptable formulation from the point of view of the clarity of the claims according to Article 6 PCT, since the skilled person is given no hint whatsoever in these claims as to the technical means needed to solve the stated problem and also, for the same reason, from the standpoint of sufficiency of disclosure of these claims (Article 5 PCT), since the skilled person is at a loss as to which compounds to synthesise with any expectation of solving the problem. Consequently these claims are so unclear under Article 6 PCT and insufficiently disclosed (Article 5 PCT), that it is not possible to carry out a meaningful search thereon according to Article 17(2)(a)(ii) and (2)(b) PCT. Consequently these claims are not mentioned anywhere in the search report or in the non-unity motivation.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 8-10,14,23-36,41 (in part) 15,16 (in full)

Estra-1,3,5(10)-triene compounds with a cyclic substituent bound, optionally via a linker group, to position 17 of the steroid skeleton via a doubly bonded carbon or nitrogen atom, medical uses and pharmaceutical compositions thereof.

2. Claims: 8,14,23-36,41 (in part)

Estra-1,3,5(10)-triene compounds with a linear hydrocarbon substituent interrupted by at least one -O-, -S- or -NR- moiety and bound, optionally via a linker group, to position 17 of the steroid skeleton via a doubly bonded carbon or nitrogen atom, medical uses and pharmaceutical compositions thereof.

3. Claims: 8-10,23-36,41 (in part) 17-19 (in full)

Estra-1,3,5(10)-triene compounds substituted in position 11 by a doubly bound carbon or nitrogen atom, medical uses and pharmaceutical compositions thereof.

4. Claims: 11,20,23-36,41 (in part) 12,13,21,22 (in full)

17-Desoxy-estra-1,3,5(10)-triene compounds with a cyclic substituent bound, optionally via a linker group, to position 17 of the steroid skeleton via a singly bonded carbon atom, medical uses and pharmaceutical compositions thereof.

5. Claims: 11,20,23-36,41 (in part)

17-Desoxy-estra-1,3,5(10)-triene compounds with a linear hydrocarbon substituent, interrupted by at least one -O-, -S-, or -NR- moiety, bound to position 17 of the steroid skeleton via a singly bonded carbon atom, medical uses and pharmaceutical compositions thereof.

6. Claims: 37,38 (in full)

The treatment of estrogen dependent disorders using pregna-1,3,5(10)-trien-3-ol-20-one or the hydrazone thereof

7. Claim : 39 (in full)

A method for transdermal delivery of estra-1,3,5(10)-triene

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

steroids.

8. Claim : 40 (in full)

A process for the production of 7.alpha.-methyl-estrone.

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No  
PCT/US 98/27406

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3318917	A	09-05-1967	GB 1134766 A	
US 3448126	A	03-06-1969	NONE	
WO 9313123	A	08-07-1993	FR 2685332 A	25-06-1993
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